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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/616,073	07/09/2003	Itay Lusky	TI-33771	9943

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EXAMINER	
CHAUDRY, MUJTABA M	

ART UNIT	PAPER NUMBER
2133	

DATE MAILED: 01/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/616,073	LUSKY, ITAY	
	Examiner	Art Unit	
	Mujtaba K. Chaudry	2133	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3 and 10-14* is/are rejected.

7)☒ Claim(s) *4-9 and 15-18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 July 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Oath/Declaration

The Oath filed July 09, 2003 complies with all the requirements set forth in MPEP 602 and therefore is accepted.

Drawings

The drawings are objected to because:

- Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.
- Figure 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed

of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Appropriate correction is required.

Specification

Applicant is reminded of the proper language and format for an abstract of the disclosure.

> ***The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.***
>
> ***The language should be clear and concise and should not repeat information given in the title or claim(s). It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.***

The abstract of the disclosure is objected to because it isn't particularly descriptive of the novelty of the invention.

Allowable Subject Matter

Claims 4-9 and 15-18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Objections

Claim 1 is objected to because of the following informalities:

- The term "closest" is misspelled in line 4.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- The phrase, "...reduced complexity..." is a relative term and cannot be considered to a positive limitation and therefore should be avoided in the claim language.
- The language in the parenthesis will not be given patentable weight and should be brought out of the parenthesis to be in accordance with the MPEP. The term "symbol(s)" is ok.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 1-3 and 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaewell, Jr. (USPN 6005898) further in view of Ahmed et al. (USPN 6883021).

As per claim 1, Kaewell, Jr. (herein after: Kaewell) substantially teaches a communication system where the data rate of a given transmission has been encoded by a transmitter and is then used to adjust a plurality of convolutional decoders sharing common memory. The system uses common processing resources to provide up to four discrete channels having multi-rate convolutional error correction decoding resulting in a reduced silicon area and low power operation. The system is capable of supporting data communication at 8 kbps up to 64 kbps for high rate ISDN communication in receivers of both base station and consumer unit locations. Specifically, Kaewell substantially teaches choosing a constellation point closest to the received soft symbol for each TCM subset and calculating the metric of each branch based on the distance, for example squared Euclidean distance (Figure 3a and col. 6, lines 25-33); calculating a new state metric for each trellis state (col. 6, lines 60-65); selecting a the state with the smallest metric (col. 7, lines 20-22); and tracing back from the state with the smallest metric (col. 8, lines 3-16).

Not explicitly disclosed by Kaewell is receiving a soft symbol as stated in the claims of the present application.

However, Ahmed et al. (herein after referred to as single entity: Ahmed) substantially teaches, in an analogous art, methods and apparatus for decoding convolutionally encoded data, including trellis-coded modulation (TCM) systems. Ahmed teaches a memory device with a main processor, such as a microprocessor or a DSP, and advantageously relieves the main

processor of the relatively time-consuming task of decoding the convolutionally encoded data. This frees up the main processor to execute other tasks. Particularly, Ahmed teaches (Figure 1B and cols. 8-9) a computational unit 105 that includes a minimum distance unit 126, which calculates branch metrics for the computational unit 105. The minimum distance unit 126 maintains the metrics of each possible branch or path that could have been taken by the encoder. Ahmed teaches that in one embodiment, the minimum distance unit 126 calculates the Hamming distance for each branch. The Hamming distance corresponds to a sum of the number of symbols by which code words differ. In another embodiment, the minimum distance unit 126 computes the Euclidean distance, i.e., the distance between sequences, to compute the branch metrics. The minimum distance unit 126 uses the Hamming distance for hard decision decoding and uses the Euclidean distance for soft decision decoding. Hard decision decoding corresponds to decoding with only one value for each received symbol. Soft decision decoding corresponds to decoding with an estimate of a value of each received symbol together with an indication of the reliability of the estimate. Thus, where the data is represented by a single bit, hard decision decoding is used. By contrast, where the data is represented with multiple-bit precision, soft decision decoding can be used. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform decoding of soft symbol data within the method and apparatus of Kaewell. This modification would have been obvious to one of ordinary skill in the art because one of ordinary skill would have recognized that by performing soft decision decoding would have improved the signal-to-noise ratio as suggested by Ahmed (col. 9, lines 20-21).

As per claim 2, Kaewell substantially teaches, in view of above rejections, (col. 6, lines 60-64) to continuously compute state metrics on each newly received symbol, which essentially means to perform the steps stated in claim 1 for each received symbol.

As per claim 3, Kaewell substantially teaches, in view of above rejections, (col. 7, lines 1-67) to choose parallel branches between states in the trellis and assign branch metric to each branch.

As per claim 10, Kaewell substantially teaches, in view of above rejections, (col. 6, lines 25-34) calculation of branch metrics based on squared Euclidean distance.

As per claim 11, Kaewell substantially teaches, in view of above rejections, a communication system where the data rate of a given transmission has been encoded by a transmitter and is then used to adjust a plurality of convolutional decoders sharing common memory. The system uses common processing resources to provide up to four discrete channels having multi-rate convolutional error correction decoding resulting in a reduced silicon area and low power operation. The system is capable of supporting data communication at 8 kbps up to 64 kbps for high rate ISDN communication in receivers of both base station and consumer unit locations. Specifically, Kaewell substantially teaches choosing a constellation point closest to the received soft symbol for each TCM subset and calculating the metric of each branch based on the distance, for example squared Euclidean distance (Figure 3a and col. 6, lines 25-33); calculating a new state metric for each trellis state (col. 6, lines 60-65); selecting a the state with the smallest metric (col. 7, lines 20-22); and tracing back from the state with the smallest metric (col. 8, lines 3-16). Kaewell also teaches (col. 6, lines 60-64) to continuously compute state metrics on each

newly received symbol, which essentially means to perform the steps stated in claim 11 for each received symbol.

Not explicitly taught by Kaewell is receiving a soft symbol as stated in the claims of the present application.

However, Ahmed et al. (herein after referred to as single entity: Ahmed) substantially teaches, in an analogous art, methods and apparatus for decoding convolutionally encoded data, including trellis-coded modulation (TCM) systems. Ahmed teaches a memory device with a main processor, such as a microprocessor or a DSP, and advantageously relieves the main processor of the relatively time-consuming task of decoding the convolutionally encoded data. This frees up the main processor to execute other tasks. Particularly, Ahmed teaches (Figure 1B and cols. 8-9) a computational unit 105 that includes a minimum distance unit 126, which calculates branch metrics for the computational unit 105. The minimum distance unit 126 maintains the metrics of each possible branch or path that could have been taken by the encoder. Ahmed teaches that in one embodiment, the minimum distance unit 126 calculates the Hamming distance for each branch. The Hamming distance corresponds to a sum of the number of symbols by which code words differ. In another embodiment, the minimum distance unit 126 computes the Euclidean distance, i.e., the distance between sequences, to compute the branch metrics. The minimum distance unit 126 uses the Hamming distance for hard decision decoding and uses the Euclidean distance for soft decision decoding. Hard decision decoding corresponds to decoding with only one value for each received symbol. Soft decision decoding corresponds to decoding with an estimate of a value of each received symbol together with an indication of the reliability of the estimate. Thus, where the data is represented by a single bit, hard decision decoding is

used. By contrast, where the data is represented with multiple-bit precision, soft decision decoding can be used. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform decoding of soft symbol data within the method and apparatus of Kaewell. This modification would have been obvious to one of ordinary skill in the art because one of ordinary skill would have recognized that by performing soft decision decoding would have improved the signal-to-noise ratio as suggested by Ahmed (col. 9, lines 20-21).

As per claim 12, Kaewell substantially teaches, in view of above rejections, (col. 6, lines 60-64) to continuously compute state metrics on each newly received symbol, which essentially means to perform decoding for each received symbol.

As per claim 13, Kaewell substantially teaches, in view of above rejections, (Figure 6) dividing the constellation region into regions. Kaewell teaches the Euclidean distance calculation engine 65 compares all received symbols p per channel by mapping them onto a QPSK constellation x.sub.00, x.sub.01, x.sub.10, x.sub.11. It is necessary to examine each received point p due to corruption during transmission 47 by noise and distortion, whether multipath or radio frequency. The geometry engine 65 computes the four distances d.sub.00, d.sub.01, d.sub.10, d.sub.11 from the received symbol p and chooses the shortest distance d.sub.00. The enabling mechanism used is based upon the transmitted data rate for a particular channel. A gain in overall processing efficiency is achieved since the calculations are only performed in the Euclidean distance engine 65 if a new I and Q symbol has been released to it and the geometry engine 65 has been properly enabled.

As per claim 14, Kaewell substantially teaches, in view of above rejections, (col. 6, lines 25-34) calculation of branch metrics based on squared Euclidean distance.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Additional pertinent prior arts are included herein for Applicant's review.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mujtaba K. Chaudry whose telephone number is 571-272-3817. The examiner can normally be reached on Mon-Thur 9-7:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert DeCady can be reached on 571-272-3819. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mujtaba Chaudry
Art Unit 2133
January 9, 2006

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